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Resilience in the disabling effect of gait speed among older Turkish and Moroccan immigrants and native Dutch

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Abstract

Objectives: To investigate the factors that inhibit the disabling effect of impairments among citizens who have migrated from Turkey and Morocco and native Dutch according to a resilience perspective.

Methods: Using data from the Longitudinal Aging Study Amsterdam with 928 native Dutch, 255 Turks and 199 Moroccans aged 55-64, linear regression analysis assessed whether country of origin, mastery, income and contact frequency modified the relationship between gait speed and activity limitations.

Results: Turkish, but not Moroccan, immigrants demonstrated stronger associations between gait speed and activity limitations than the native Dutch. Mastery modified the association among the Dutch and the Turkish immigrants. Income modified the association only among the Dutch. Effect modification by contact frequency was not observed.

Discussion: Moroccan immigrants and Dutch older adults appeared to be more resilient against impairments than Turkish immigrants. As none of the resilience factors buffered in all three populations, we conclude that resilience mechanisms are not universal across populations.

Introduction

Against a background of population ageing in Western countries, the prevalence of chronic illness and physical impairments is on the rise (Galenkamp, Braam, Huisman, & Deeg, 2012; Parker & Thorslund, 2007). This holds especially for non-Western labour immigrants and their families living in Western Europe, whose experience of migration is related to a number of risk factors on developing physical impairments in older ages. Labour immigrants, in particular, are subjected to high risks of impairments in older age, because their migration history often implies the performance of hard manual labour throughout the life course (Solé-Auró & Crimmins, 2008). Because impairment is considered to be a leading cause of disability (Verbrugge & Jette, 1994), so too is a disproportionately high number of labour immigrants expected to have high levels of disability in older ages (Reijneveld, 1998; Solé-Auró & Crimmins, 2008; Uniken Venema, Garretsen, & van der Maas, 1995). This is concerning because disabilities are associated with loss of work, increased medical costs, and a greater risk of early mortality (Zunzunegui et al., 2005). The question is to what extent mechanisms are effective in inhibiting the process by which physical impairments lead to subsequent disability, i.e. so-called resilience factors in the face of physical impairments among labour immigrants compared to native populations.

Central in our study are hypothesized associations between impairment and disability. In the disablement process model, age-related disability arises from diseases and conditions, which may lead to impairments, which in turn may lead to disability (Verbrugge & Jette, 1994). Disability has been defined as the extent to which a person is able to perform daily tasks important for independent living; data are often acquired through self-rating. Physical impairment is defined as dysfunctions and structural abnormalities and can be measured by performance-based tests of impaired mobility, such as gait speed. The finding that persons with physical impairments are more likely to experience higher rates of disability, has been well explicated (Vermeulen, Neyens, Van Rossum, Spreuwenberg, & De Witte, 2011). Underlying this transition is the idea that performance tests are able to measure modes of physical deterioration before reaching the threshold of self-perceived severity (Rozzini et al., 1997). The transition from impairments towards disability can be influenced by differences in the broader socio-cultural environment for various reasons. Performance tests are usually more indicative of specific aspects of functioning whereas measures of disability measure a broader number of tasks reported in interaction with the environment, i.e., the equipment that is used and the practical aids that are available. Furthermore, cognitive functioning, personality characteristics and socio-demographic variables may impinge on the transition from impairments towards disability, resulting in an under or over estimation of a person's physical capabilities when estimated on the basis of the level of impairment (Kempen, Stevering, Ormel, & Deeg, 1996).

The present study focuses on resilience within the context of the disablement process in citizens who have migrated (from now on: immigrants) and native populations. In developmental psychology resilience has been defined as successful adaptation in the context of significant adversity or risk (Rutter, 1987). Hence, resilience is an inferential concept, which hinges on the presence of a good outcome and the presence of a significant adversity or risk (Masten, 2001; Rutter, 1990). Thus, rather than assuming that risk factors foster negative outcomes for a population at-risk, resilience provides a lens which is sensitive to variability in the way groups and persons respond to risk factors. A study of resilience is, subsequently, geared towards the capacities which help groups or persons to navigate their way through the psychological, social, cultural and physical resources in order to sustain a good outcome (Ungar, Ghazinour, & Richter, 2013). The concept of resilience has been applied within the context of the disablement process once before. Manning, Carr and Kail (2016) focussed on the extent to which a resilient personality helped older adults maintain low rates of disability in the presence of chronic diseases. Similarly, the current study identifies factors that helped both immigrant and native populations to sustain low rates of disability in the presence of physical impairments. We do so, according to two approaches towards investigating resilience. We establish, firstly, which population, either native or immigrant, maintains relatively low levels of disability in the presence of physical impairments in a *between-group* approach towards investigating resilience. Secondly, we investigate whether there is variation within populations, native and immigrant in the extent to which physical impairments lead to disability in a *within-group* approach towards investigating resilience.

Between-group resilience

Variety in the way in which impairments result in disability across native and immigrant populations is often overlooked. The focus has been more on the finding that immigrants are more likely than native populations to experience disability (Denktaş, 2011; Peek, Ottenbacher, Markides, & Ostir, 2003; Schellingerhout, 2004). Indeed, with regards to the life course of labour immigrants and their wives, a heightened impact on disability is likely to occur (de Snyder & Diaz-Guerrero, 2003). From the labour migration of Turkish and Moroccan immigrants towards the Netherlands, for example, we know that migration often occurred from the poorer rural areas in Turkey and Morocco among persons who received little to no formal education (Uniken Venema, Garretsen, & van der Maas, 1995). These risks may be compounded by the fact that after migration, educational level often remained low (Schellingerhout, 2004), experience of discrimination emerged (Pettigrew, Jackson, Brika, Lemaine, Meertens, Wagner, et al., 1997) and language barriers hampered access to specialized care (Fassaert, Hesselink, & Verhoeff, 2009). In addition, more so than among the native population, the presence of physical impairments could hamper the chance of employment as immigrants often occupy jobs that require them to be physically fit (Reijneveld, 1998).

Despite these risks associated with an immigration experience, there may also be capacities that could potentially give immigrants an advantage over the native population. First, labour migration is often associated with overcoming multiple material and social barriers, which demonstrates that immigrants may be particularly skilled in mobilizing resources to deal with adversity (Bhugra & Becker, 2005; Solé-Auró & Crimmins, 2008). Authors have even considered migration to be a resilience process in itself because it implies that immigrants are able to move away from situations of economic dependency and financial hardship, seeking a better life for themselves and their families (Adger, 2000; de Snyder & Diaz-Guerrero, 2003; Wong & Song, 2008). Second, it is unlikely that immigrants are a random sample of the population of origin. Instead, immigrants may be drawn from groups with lower socioeconomic position (SEP) who are healthy at the time of migration. Therefore, immigrants may be more resilient than their equivalent low SEP non-immigrant peers from the outset of migration (Acevedo-Garcia, Sanchez-Vaznaugh, Viruell-Fuentes, & Almeida, 2012). This 'healthy migrant effect' has been evidenced empirically for immigrants in Canada, Australia and the United States of America (Kennedy, Kidd, McDonald, & Biddle, 2015). Although the healthy migrant effect seems to diminish as immigrants grow older in the country of destination (Mutchler, Parkash, & Burr, 2007), it clearly demonstrates that immigrants potentially have abilities and resources that indicate resilience.

With this in mind, we depart from two potential hypotheses when investigating between-group resilience in the transition from impairment towards disability. First, we take into account potential resilience mechanisms derived from the notion of "steeling" experiences. Steeling refers to the mechanism that repeated exposure to adversity provides repeated opportunity to cope with adversity thereby enhancing one's ability to maintain a good outcome (Rutter, 2012). Especially with regards to the rate of physical impairments, which is assumed to be particularly high among populations of labour immigrants (Denktaş, 2011), there were opportunities to mobilize resources, granting them the capacities to deal with physical impairments. Transferring this reasoning to resilience, we hypothesize that Turkish and Moroccan immigrants experience less severe disability in the face of impairments, i.e., are more resilient, than the native Dutch population (Hypothesis 1A). Second, steeling effects in immigrants and opportunities to cope with impairment may have been trumped by the severity of impairment with which immigrants were confronted. In this latter case, native populations have an advantage over immigrants and we hypothesize that immigrants experience more severe disability in the face of impairments, i.e., are less resilient, than the native Dutch population (Hypothesis 1B).

Within-group resilience

The study of resilience is characterized by a search for protective or resilience factors, which are shared by persons who are able to vent off adversities and reach a good outcome. A

key aspect of the disablement model is that internal and external qualities can speed up or slow down the process towards disability (Verbrugge & Jette, 1994). Because psychological and socio-cultural factors reflect individual's subjective perception and evaluation of situations, these factors may play important roles in the adaptation to impairments and resilience against disability and thus lead to variability in the population (Jang, Haley, Small, & Mortimer, 2002). Verbrugge and Jette (1994) mention several of these qualities, including internal qualities (i.e. locus of control, positive adaptation) and external support (i.e. personal assistance). When investigating resilience within populations of immigrant and native origin, the present study considers three potential resilience factors in the disablement process: feelings of control over the environment (i.e. sense of mastery, from now on "mastery") (Pearlin & Schooler, 1978), having high income (Stepleman, Wright, & Bottonari, 2009) and having frequent contact with social network members (Seeman, Bruce, & Mcavay, 1996).

Several studies show that a high mastery is a crucial psychological resource in providing psychological resilience and facilitating adaptation to stressful life situations including chronic diseases (Kempen, Felicic, & Ormel, 1997), functional decline (Kempen, Stevering, Ormel, & Deeg, 1996) and caregiving (Bookwala & Schulz, 1998). Mastery may enable individuals to prevent or manage health-related problems. For example, individuals with a high mastery are more likely to use preventive care, have good health behaviours, seek medical treatment early and use health services properly (Menec & Chipperfield, 1997). In addition, mastery may help individuals to effectively mobilize personal resources and apply coping strategies. We investigate whether the positive effect of mastery can be observed in the immigrant and native populations under study. Previous research shows that while an immigration experience does not necessarily promote mastery, those with high mastery are more likely to have completed the migration process (Forbes, 2001). Positive effects of mastery are replicated among African Americans (Jang, Borenstein-Graves, Haley, Small, & Mortimer, 2003), Hispanics (Mui & Burnette, 1996), and Asians (Jang, Haley, Small, & Reynolds, 2000). Hypothesis 2A is that persons with high mastery both within immigrant and native populations are more protected from the disabling effect of physical limitations than persons with low mastery.

Against a background of impairment, having a higher income may foster the means to seek medical support or other external assistance in time of need (Stepleman, Wright, & Bottonari, 2009). Measures of income reflect the material effects of social class position, as persons with lower levels of income or wealth are exposed to poor sanitation and housing, or are deprived from protections that can be purchased against those factors (Mackenbach et al., 2005). Similar to mastery, persons with higher income are more likely to use preventive care, have good health behaviours and the ability to use health services properly (Reijneveld, 1998; Stepleman, Wright, & Bottonari, 2009). Persons with higher income are, furthermore, less likely to experience social deprivation and low self-esteem. These factors may, in turn,

contribute to lower levels of impairments and disability (Jang, Borenstein-Graves, Haley, Small, & Mortimer, 2003). Hypothesis 2B is that persons with high income both within immigrant and native populations are more protected from disabling effect of physical impairment than persons with a low income.

Finally, we examine the social network as a potential resilience factor. The social network may buffer against physical health problems in several ways (Berkman, Glassm, Brissette, & Seeman, 2000). The number of social ties and the frequency of contact with those ties, may enhance a sense of fulfilling important social roles. Especially in the face of impairments, social contact outside the household may enhance motivation to perform tasks of daily living in order to maintain social roles (Mendes de Leon, Gold, Glass, Kaplan, & George, 2001). Furthermore, emotional and instrumental support is provided within frequent contacted ties such as assistance with common daily tasks. We hypothesize that persons who have frequent contact with persons outside of the household both within immigrant and native populations are more protected against the disabling effect of physical impairment than persons who do not have frequent contact with persons outside of the household (Hypothesis 2C).

Methods

Sample

Data are collected in the context of the Longitudinal Aging Study Amsterdam (LASA). LASA is geared towards understanding determinants and consequences of ageing trajectories in social, cognitive, physical and emotional domains of functioning in older adults (Huisman et al., 2011). In 2012-2013, LASA included a sample of 1,023 native Dutch respondents born in 1948-1957. The sample was drawn from the population registers of eleven Dutch municipalities that differ with regards to the degree of urbanization and location in culturally different regions in the Netherlands. The cooperation rate was 63%. From this sample, we excluded 88 respondents who were not born in the Netherlands.

LASA included a sample of immigrants in 2013-2014. Turkish and Moroccan immigrants, specifically, are the two of the second and third largest immigrant populations over 55 currently living in the Netherlands (Statistics Netherlands, 2017). While they migrated from different countries, they often receive special interest from policymakers because they are exceptionally disadvantaged and are considered to have a greater distance to the Dutch population in terms of culture, language proficiency and mean level of education (Schellingerhout, 2004). Turkish and Moroccan immigrants in the Netherlands predominantly live in cities, and therefore additional samples of Turkish and Moroccan immigrants of the same birth years (1948-1957) were drawn from the registers of fifteen Dutch cities with a

population size between 85 and 805 thousand. In 2013-2014, 269 respondents of Turkish origin and 209 respondents of Moroccan origin were interviewed (cooperation rate 45%). Trained interviewers, of the same ethnic background and gender as the interviewees, conducted face-to-face interviews with respondents. For Turkish and Moroccan immigrants, a translated interview was available if needed (Turkish, Moroccan Arabic/Darija and Tarafit). From the Turkish and Moroccan sample we excluded two and three respondents respectively who were not born in Turkey or Morocco. We excluded one Turkish respondent due to missing data on the activity limitations variable. Furthermore, we excluded seven Dutch, eleven Turkish and seven Moroccan respondents due to missing data on the gait speed variable. The sample sizes included in the analyses are 928 native Dutch, 255 Turkish and 199 Moroccan respondents.

Measurements

Disability. Respondents were asked to indicate whether they were able to perform seven daily tasks: going up and down a staircase; use your own or public transportation; cut your own toenails; dress and undress yourself; sit down and stand up from a chair; walk outside; take a shower or bathe. There were five response options: no difficulty; some difficulty; much difficulty; only with help; and unable, coded as 0 to 4. Sum scores were calculated with range 0-28. Cronbach's alpha was 0.81, 0.87, and 0.79 for Dutch, Turkish and Moroccan respondents, respectively. In order to diminish measurement bias in the activity limitations scale we investigated potential existence of differential item functioning (the analysis is depicted in appendix A). Consistent with results from studies on measurement equivalence of ADL (Chan, Kasper, Brandt, & Pezzin, 2012; Sayegh & Knight, 2013), four items turned out to have similar item characteristic curves across the populations. Three items showed statistically significant amounts of differential item functioning by unfavourably reflecting on one or two populations, i.e. can you walk up and down a staircase of 15 steps without resting; take a shower or bathe; can you cut your own toenails. We performed sensitivity analyses to investigate if results changed meaningfully after removing these three items, but the results were similar to those reported in the result section (the analysis is depicted in appendix A).

Impairment. Performance-based tests are chosen as a measure for impairment because they have high reproducibility, high validity for the task being performed, are sensitive to change, and are subjected to low influence of poor cognitive functioning, culture, language, and education. Gait speed, in particular, is considered an especially potent predictor for impaired mobility and is frequently used by researchers in gerontology and geriatrics due to its high reproducibility (Cummings, Studenski, & Ferrucci, 2014). Respondents were asked to walk three meters, turn around and walk back as fast as possible. The total time needed to complete the test was recorded, and ranged from 4 to 11 seconds.

Country of origin distinguishes between persons born in the Netherlands, in Turkey, and in Morocco.

Mastery was assessed through a five-item abbreviated version of the Pearlin Mastery Scale (Pearlin & Schooler, 1978). An example: I often feel helpless dealing with the problems of life. Response categories range from 1=strongly disagree to 5=strongly agree. The total score ranged from 5 to 25. Cronbach's alpha for Dutch, Turkish and Moroccan respondents were 0.75, 0.81 and 0.83 respectively.

Contact frequency with social network members. Respondents were asked how often they had contact with people they are associated with, other than those in the household (Schellingerhout, 2004). Six relationship types were assessed: children; grandchildren; children-in-law; uncles, aunts, siblings in-laws; [Moroccan, Turkish] friends, acquaintances, [Dutch or other] friends acquaintances, [Moroccan, Turkish] neighbours, [Dutch or other] neighbours. Response categories ranged from 0=never to 4=every day. The total score ranged from 0 to 30. Turkish and Moroccan respondents were confronted with more items than the Dutch respondents because they were asked to indicate whether the contacts with whom they associated were either immigrant or non-immigrant. Therefore, the relationship type with whom the most frequent contact was reported, either immigrant or non-immigrant, was considered for Turkish and Moroccan immigrants.

Income. Respondents were asked to indicate which category of income they (together with their partner, if present) classified themselves in. Response categories ranged from 1-11 with the lowest category indicating 454-1021 euro per month and the highest category indicating 2950 euro per month or more.

Procedure

Descriptive analyses were used to summarize the characteristics of respondents. In the case of a categorical variable, relative frequencies were presented. In the case of a continuous variable means and standard deviations or median and interquartile range were presented, as appropriate. Differences between groups of Dutch, Turkish and Moroccan origin were assessed by *F*, Chi square and Kruskal-Wallis tests, as appropriate.

We investigated the association between gait speed and activity limitations in several models. Firstly, to assess *between-group* resilience, we examined whether the relationship between gait speed and activity limitations was modified by country of origin. Due to the continuous nature of the outcome variable, linear regression was used. Five models were assessed using the pooled sample to test for confounding variables sex, age and country of origin as well as interaction terms of gait speed with country of origin. Interaction terms were computed as the product of the gait speed variable with the dummy variables for country of

origin (reference category is Dutch). For the purpose of prohibiting multicollinearity, nominal variables of gait speed were first centralized before they were included into the model. In the following analysis, the moderation hypothesis was supported if the interaction terms and the increase in model fit (F) were statistically significant whilst controlling for the main effects. In addition, estimates derived from the regression were plotted using high and low values (mean +1 SD and -1 SD, respectively) of the predictor variable in order to further examine the nature of the interaction.

To investigate *within-group* resilience we examined whether resilience factors of contact frequency with contacts outside of the household, mastery and income modified the association between gait speed and activity limitations for immigrants and native Dutch separately. We conducted stratified linear regression analyses with main effects and interactions with the three resilience factors in separate analyses. Similar to the previous approach, model improvement was assessed by whether or not model fit (F) improved. To further examine the nature of the interaction, estimates derived from the regression equations were plotted using high and low values (+1 SD and -1 SD) of the predictor variables.

Results

Means for all variables differed between the three groups (Table 3.1). For activity limitations, mean scores of Dutch (1.1) were lower than mean scores of Turkish (5.9) and Moroccan immigrants (3.4). A similar pattern was observed for mean scores on impairments, with Dutch (6.0) scoring lower than Turkish immigrants (8.5) and Moroccan immigrants (8.5), indicating that the Dutch had on average a faster gait speed than immigrants. With regards

Table 3.1. Descriptive statistics

	All	Turkish immigrants	Moroccan immigrants	Native Dutch	
	$N = 1382$	$N = 255$	$N = 199$	$N = 928$	
	$M (SD)$	$M (SD)$	$M (SD)$	$M (SD)$	
Age in years (54-65)	60.6 (3.0)	60.7 (3.1)	61.1 (2.9)	60.4 (2.9)	
Gender (female)	680 (49)	115 (45)	75 (38)	490 (53)	
Activity limitations (0-28)	2.2 (4.1)	5.9 (6.2)	3.4 (4.2)	1.1 (2.5)	***
Impairment (gait speed; 4-11)	6.9 (2.0)	8.5 (2.0)	8.5 (2.2)	6.1 (1.5)	***
Mastery (5-25)	17.6 (4.2)	13.4 (4.3)	16.9 (5.3)	18.8 (3.2)	***
Income (1-11)	6.7 (3.7)	3.9 (2.5)	3.4 (2.4)	8.0 (3.3)	***
Contact frequency (9-30)	22.9 (3.0)	23.4 (3.2)	23.0 (3.6)	22.7 (2.7)	**

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

to the resilience factors of mastery, income and contact frequency, Dutch respondents had on average higher scores for feelings of mastery and income, and Turkish and Moroccan immigrants had higher mean scores for contact frequency in the network.

Between-group resilience

The *between-group* approach tested whether native Dutch, Turkish or Moroccan immigrants were more resilient by testing which group had the smallest effect of gait speed on activity limitations based on Hypotheses 1A and B. Four regression models were examined within the pooled sample (Figure 3.1, Table 3.2). The level of gait speed predicted the level of activity limitations ($R^2 = 0.35$) and the model improved after the inclusion of the interaction effects ($R^2 = 0.41$). Inclusion of age and gender did not change substantially coefficients for gait speed and country of origin. Therefore, these covariates were excluded from the model. According to Table 3.2, Model 1, and the corresponding Figure 3.1, Moroccans and native Dutch show comparable levels of difficulties with daily living across higher and lower levels of gait speed. Turkish immigrants differed from the other samples both with regards to the level of activity limitations and the rate at which the level of activity limitations increased over levels of gait speed. Contradicting both hypotheses 1A and B this indicates that Turkish immigrants differed from Moroccan immigrants with regards to the experience of gait speed leading to activity limitations.

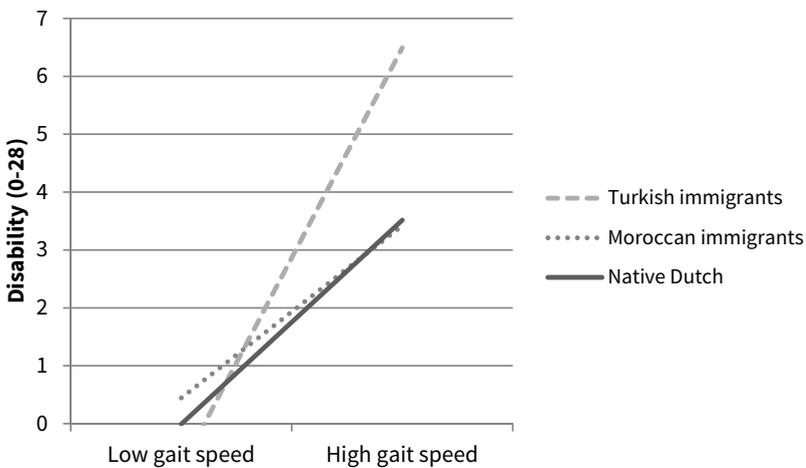


Figure 3.1. The relationship between impairments and disability for the three groups.

Table 3.2. Linear regression of activity limitations

	Model 1			Model 2			Model 3			Model 4		
	B	p	SE									
Constant	2.26	.000	0.10	2.26	.000	2.04	1.89	.000	0.14	1.75	.000	0.13
Gait speed	1.22	.000	0.05	1.21	.000	0.28	1.22	.000	0.05	0.86	.000	0.08
Age				0.08	.030	0.03						
Female							0.76	.000	0.20			
Turkish (reference: Dutch)										1.11	.000	0.31
Moroccan (reference: Dutch)										0.20	.609	0.35
Gait speed * Turkish										0.91	.000	0.13
Gait speed * Moroccan										-0.13	.348	0.14
R ²	0.35	.000		0.35	.030		0.36	.000		0.41	.000	

Within-group resilience

Results of the analyses on within-group resilience based on Hypotheses 2A, B and C are reported in Tables 3.3a-c. These hypotheses predict that higher levels of mastery, income and contact frequency, respectively, provided a buffer in the relationship between impairment and disability within each group separately. Upon inclusion of the main effects of mastery, income and contact frequency, both including mastery and income in the model made a contribution to the model in each of the three groups indicating confounding associations with these indicators. For the Dutch respondents we found interactions between gait speed and mastery as well as between gait speed and income. As Figure 3.2a and 3.2b indicate, we found a buffering effect of mastery (Hypothesis 2A) and income (Hypothesis 2B) against the

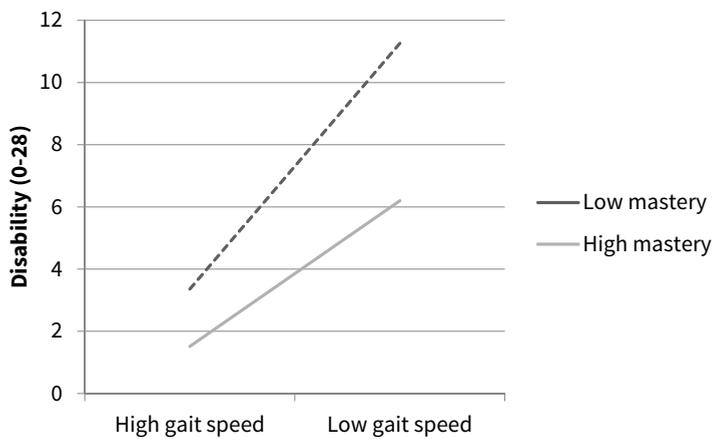


Figure 3.2a. The relationship between impairments and disability for Dutch persons with higher and lower sense of mastery.

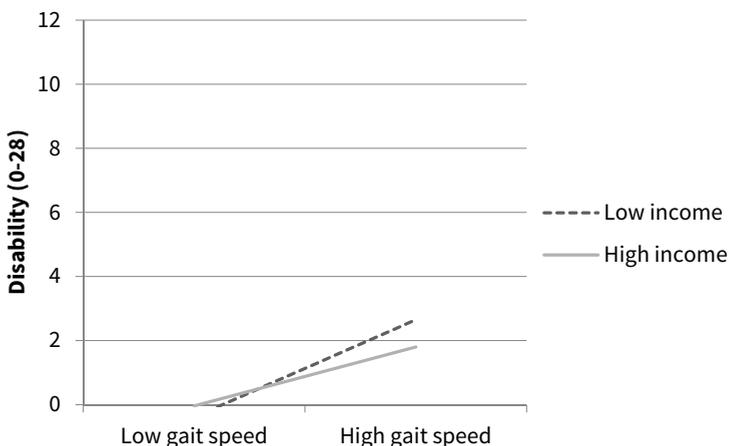


Figure 3.2b. The relationship between impairments and disability for Dutch persons with higher and lower sense of incomes.

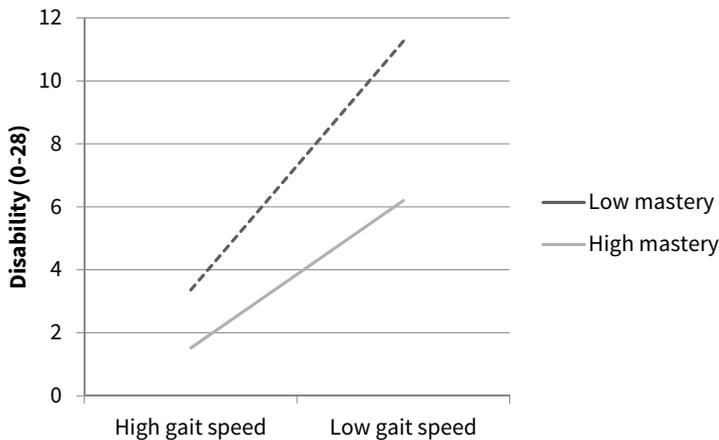


Figure 3.3. The relationship between impairments and disability for Turkish immigrants with higher and lower sense of mastery.

negative effect of gait speed on activity limitations among the Dutch respondents. For Turkish respondents we also found that mastery (Hypothesis 2A) buffered in the association between gait speed and activity limitations (Figure 3.3). In contrast to the Dutch respondents, however, income did not have a buffering effect in this relationship for the Turkish immigrants. For the Moroccan respondents none of the resilience factors buffered in the association between gait speed and activity limitations. No support was found for Hypothesis 2C.

Discussion

We investigated resilience in the transition from impairments to disability across immigrant and native populations of young-old people in the Netherlands. The level of impairment was assessed using gait speed and disability was assessed using activity limitations. We observed group differences of impairment and disability between native and immigrant groups which were consistent with our expectations as well as findings from prior studies (Denktaş, 2011; Schellingerhout, 2004): rates of impairment and disability were higher among Turks and Moroccans than among native Dutch. In the *between-group* approach towards investigating resilience we observed that Turkish immigrants experienced more severe disabling effects from impairments than native Dutch and Moroccan immigrants. We therefore did not find evidence for the steeling effects hypothesis (Hypothesis 1A) or for the opposite Hypothesis 1B where we assumed that steeling effects in immigrants were overruled by the severity of the impairment with which immigrants were confronted. In answering the question as to what population is most resilient, and following suggestions from the resilience literature

Table 3.3a. Within-group resilience native Dutch: Regression of activity limitations on gait speed and resilience

	Model 1			Model 2			Model 3			Model 4		
	B	p	SE									
Constant	1.06	.000	0.07	0.99	.000	0.07	1.010	.000	0.08	1.06	.000	0.08
Gait speed	0.86	.000	0.05	0.77	.000	0.05	0.831	.000	0.06	0.86	.000	0.05
Mastery				-0.11	.000	0.02						
Gait speed * Mastery				-0.09	.000	0.01						
Income							-0.04	.125	0.02			
Gait speed * Income							-0.06	.000	0.01			
Contact frequency										-0.01	.767	0.03
Gait speed * Contact frequency										0.01	.456	0.02
R ²	0.24	.000		0.30	.000		0.27	.000		0.24	.456	

Table 3.3b. Within-group resilience Turkish immigrants: Regression of activity limitations on gait speed and resilience

	Model 1			Model 2			Model 3			Model 4		
	B	p	SE									
Constant	5.82	.000	0.32	5.59	.000	0.31	5.72	.000	0.34	5.82	.000	0.33
Gait speed	1.78	.000	0.16	1.57	.000	0.15	1.60	.000	0.17	1.78	.000	0.17
Mastery				-0.40	.000	0.07						
Gait speed * Mastery				-0.09	.009	0.04						
Income							-0.48	.001	0.14			
Gait speed * Income							-0.12	.121	0.08			
Contact frequency										0.04	.725	0.10
Gait speed* Contact frequency										0.02	.690	0.05
R ²	0.33	.000		0.40	.009		0.36	.121		0.33	.690	

Table 3.3c. Within-group resilience in Moroccan immigrants: Regression of activity limitations on gait speed and resilience

	Model 1		Model 2		Model 3		Model 4	
	B	p	B	p	B	p	B	p
Constant	3.10	.000	2.91	.000	2.92	.000	3.07	.000
Gait speed	0.74	.000	0.62	.000	0.56	.001	0.71	.000
Mastery			-0.25	.000				
Gait speed * Mastery			-0.04	.075				
Income					-0.53	.001		
Gait speed * Income					-0.11	.052		
Contact frequency							-0.21	.013
Gait speed * Contact frequency							-0.05	.230
R ²	0.13	.000	0.20	.075	0.12	.052	0.18	.230

(Luthar, Cicchetti, & Becker, 2000; Masten, 2001; Rutter, 1987; Windle, 2008), we find that both the Moroccans and the native Dutch with a high-risk exposure to impairment responded better, and are therefore more resilient against the disabling effect of physical impairments than Turks.

Important to note is that the differences in disability across populations are unlikely to be a result of measurement bias. We conclude this on the basis of our check of differential item functioning and the sensitivity analyses that we performed, excluding the items that showed statistically significant evidence of differential item functioning. These sensitivity analyses did not result in substantially different results. In other words, Turkish immigrants report more disability because they actually experience higher levels of disability from impairment, and not because the latent construct of disability is dissimilar over the three populations included in our study. Therefore, we distinguish measurement bias from the structural reasons to report disability.

Apparently having had a migration experience is not the most important denominator for resilience against the disabling effect of physical impairment. One tentative explanation for this finding may be that Turks differ from the other two populations with regards to their expectations in relation to their own health status and in relation to their social environment. Unlike Morocco, Turkey already had a Western educational system in place around the time that most labour migration towards the Netherlands occurred (Reijneveld, Spijker, & Dijkshoorn, 2007). This is reflected in the fact that Turks on average had a slightly higher educational level than Moroccans upon arrival in the Netherlands (Crul & Doornik, 2003). Turkish immigrants are also being portrayed as more active than their Moroccan counterparts in terms of self-employment (Dagevos, 2001) while simultaneously facing more inward to their own group in terms of social and cultural values (Phalet & Schönplug, 2001). We suspect that these differences could offer an explanation for our findings for two reasons. First, an active attitude and high achievement values may be accompanied with heightened expectations for one's own health. As a consequence, Turkish immigrants may be more inclined than Moroccan immigrants to experience more activity limitations in a context of physical impairment when their high expectations regarding their physical functioning are left unmet. Second, a focus on the own group among Turks often brings about lagged or selective acculturation patterns resulting in collectivism and a high importance of group serving values (Phalet & Schönplug, 2001). One of the ways in which collective values may emerge, is in times of need and disability when the family is expected to offer the assistance that is deemed appropriate (Yerden, 2012). This socio-cultural context may, as a consequence, influence Turkish immigrant's perceptions of impairment and disability. Such effects have, for example, been observed in cross-national studies conducted in Europe. These studies show that reporting activity limitations is more common in societies with high collective as

opposed to individualistic values, possibly for the purpose of mobilizing assistance and aid (Murray & Lopez, 1997; Zunzunegui, Nunez, Durban, de Yébenes, & Otero, 2006). When we extrapolate this reasoning into the findings of our study, Turkish immigrants may be more inclined to experience and report higher levels of disability in the context of high impairments compared to native Dutch and Moroccan immigrants.

With respect to *within-group* resilience we investigated the buffering effect of mastery, income and contact frequency as potential resilience factors. The finding that mastery appears to buffer in the Turkish population but not in the Moroccan population (Hypothesis 2A) supports the idea that these populations differ with regards the resilience mechanism underlying the transition from impairment to disability. Moreover, despite the fact that Moroccans score higher than Turks on mastery measures, mastery appears to be less important in protecting them from disability in a context of high impairment. This may be in line with the tentative explanation proposed above that, Turkish immigrants have higher expectations than Moroccans when it comes to their physical health status. Turkish immigrants may, as a consequence, place more value in actively seeking to manage and control their environment in order to maintain their functioning. Moroccan immigrants, by contrast, may place less importance on feelings of control and may draw on other resources, such as religion (Schieman, Pudrovska, Pearlman, & Ellison, 2006), in order to cope with high levels of impairment.

A potential protective effect of income was suggested in prior studies, with explanations ranging from higher access to care among individuals with higher income (Stepleman Wright & Bottonari, 2009), to fewer risky environmental factors such as poor housing (Kessler & Cleary, 1980). However, we observed that higher income only buffered in the association between impairment and disability in the Dutch population but not in the Turkish and Moroccan populations (Hypothesis 2B). One potential explanation for the absence of this buffering effect among Turks and Moroccans is that in a context where income is generally low, as is the case for immigrants, income may not be able to differentiate as much between different outcomes.

Lastly, the resilience factor that did not foster resilient outcomes in any of the groups was contact frequency. Hypothesis 2C was therefore rejected. The result is in contrast with prior studies which have shown that social ties are an important protector against disability decline across Europe (Zunzunegui et al., 2005) as well as within native and black populations in the U.S. (Mendes de Leon, Gold, Glass, Kaplan, & George, 2001). Our finding does not support the mechanism that social ties may enhance a sense of fulfilling important social roles in the presence of impairment. It could be that social contacts are less important for feelings of personal control among native Dutch as they may value functional dependency above the

maintenance of social contact (Avlund, Luck, & Tinsley, 1996). Furthermore, immigrants may bring more complexity into this relationship, as they are likely to be part of a geographically dispersed network (Angel & Angel, 1992). The sense of fulfilment and feelings of competency may for immigrants be counteracted by the feelings of homesickness and loss that this contact may also evoke. Another explanation is that, similar to income, contact frequency within populations of Turkish and Moroccan immigrants and native Dutch varied only slightly. The factor may, therefore, not be able to differentiate between outcomes.

We mention some limitations of the study. First, our study was cross-sectional, which limits causal inference. Although a strong theoretical model implied the causal direction of impairments towards disability, both disability and mastery are known to fluctuate over time (Deeg & Huisman, 2010; Mendes de Leon et al., 2001; Pearlin et al., 2007). This does not rule out the alternative possibility that a decrease in mastery is a consequence of a decrease in disability rather than the other way around. Second, we recognize that residual heterogeneity may have affected the presented findings given the small number of individuals who reported higher disability. Especially with regards to the native population dependency in the self-reported items of disability was rather uncommon, which may have resulted in ceiling effects limiting the range of disability that can be captured. Third, as our aim was to investigate resilience between groups in the disablement process we chose to investigate one transition, that is the transition from impairments to disability, in the disablement process. However we recognize that underlying disease patterns such as varying prevalence of chronic diseases within populations may be important causes of difference between the groups in the transition from impairments to disability (Manning, Carr, & Kail, 2014; Verbrugge & Jette, 1994). Future studies may include more steps in the disablement process in order to investigate the influence of factors earlier in the disablement process. Fourth, cooperation rates and sample sizes of the Turkish and Moroccan samples were relatively small. We were not able to assess whether selection in level of impairment or activity limitations may have occurred. Fifth, we did not control for the age of migration in our models. While prior studies have shown that age of migration may be important for several health outcomes (Angel & Angel, 1992; Mutchler, Prakash, & Burr, 2007), there was no clear direction as to how this would affect our population of whom 96% has a duration of residence of over fifteen years.

We express caution when generalizing these findings to different immigrant populations. Our results show that Turkish and Moroccan immigrants were different with regards to both their transition from impairments into disability and with regards to the protective mechanisms that lay behind it. This is so, even though both immigrant groups are often casted under the same label in Dutch health research due to similarities with regards to the migration characteristics, unfamiliarity with Dutch language and their cultural distance to the host population (Denktaş, 2011). However, as others also have stressed previously, health

differences between immigrant groups may exist according to the country of origin, unique migration experiences as well as the context of the settling country (Markides, Eschbach, Ray, & Peek, 2007; Nazroo, Jackson, Karlsen, & Torres, 2007). Therefore, we stress that it is not so much a question of generalizing *our* results to other immigrant populations but a question of highlighting potential resilience mechanisms as well as potential buffering resources which may be important among immigrant populations. As such the study may contribute to wider understandings on the mechanisms that produce resilience in a context of inequalities among immigrant populations.

To our knowledge, this was the first study capturing *between* and *within* group resilience in the transition from impairments to disability. Two aspects of this study particularly are relevant for the study of resilience in immigrant and native populations. First, in our hypothesis about between-group resilience we initially distinguished immigrants on the one hand from native Dutch on the other. However, the results of our study highlighted crucial differences between immigrant populations. This finding warrants future studies, to look beyond familiar characteristics of these populations in order to shed light on the social forces resulting from the pre- and post-migration experiences that may impinge on the disablement process. Second, our study demonstrates that the mechanisms of resilience may vary from population to population given their cultural context. In particular, some resilience factors confer buffering effects in one population but not in another. In order to understand cultural differences in resilience processes, future studies should incorporate contextually relevant frameworks for the investigation of resilience across populations in order to detect culturally based protective processes.

Supplement to Chapter 3

Additional analysis

Differential item functioning for activity limitations and sensitivity analysis

Differential item functioning

We tested differential item functioning for activity limitations in Turkish and Moroccan immigrants and native Dutch groups. Differential item functioning refers to the situation where differences exist in the way a test item functions across different social groups matched on the consequential implications for test use (Osterlind & Everson, 2009). We did so, according to performing 7 subsequent regression analysis with the 7 items of activity limitations as the dependent variable and the total score on the scale for activity limitations and country of origin as independent variables. In addition, to each of the models we added two interaction terms which included Turkish immigrant versus activity limitations and Moroccan immigrant versus activity limitations. We noted 3 cases of potential differential item functioning (i.e. can you walk outside; can you use your own or public transportation; can you cut your own toenails), which we then tested in further analysis.

Sensitivity analysis

The sensitivity analysis was performed by removing the three variables in which we noted potential differential item functioning one by one and rerunning the models of activity limitations, gait speed and country of origin. The objective was to establish whether removal of the three variables changed the results in such a way that the conclusions of the study needed to be altered. Below mentioned are the results of rerunning the models after removing each of the three items for the activity limitations scale (Results are depicted in Table 3.1a 3.1b, 3.1c, 3.1d). Even after removal of the items, each of the three models supported the same conclusion, namely that Turks, but not Moroccans, demonstrated stronger associations between gait speed and activity limitations than the Dutch.

Table 3.1a. Linear regression of activity limitations

	Model 1			Model 2			Model 3		
	<i>B</i>	<i>p</i>	<i>SE</i>	<i>B</i>	<i>p</i>	<i>SE</i>	<i>B</i>	<i>p</i>	<i>SE</i>
Constant	2.26	.000	0.10	2.26	.000	2.04	1.75	.000	0.13
Gait speed	1.22	.000	0.05	1.21	.000	0.28	0.86	.000	0.08
Turkish (reference: Dutch)							1.11	.000	0.31
Moroccan (reference: Dutch)							0.20	.609	0.35
Gait speed * Turkish							0.91	.000	0.13
Gait speed * Moroccan							-0.13	.348	0.14
R ²	0.35	.000		0.35	.030		0.41	.000	

Table 3.1b. Linear regression of activity limitations without the item on walking outside

	Model 1			Model 2			Model 3		
	<i>B</i>	<i>p</i>	<i>SE</i>	<i>B</i>	<i>p</i>	<i>SE</i>	<i>B</i>	<i>p</i>	<i>SE</i>
Constant	1.98	.000	0.08	1.64	.000	0.10	1.48	.000	0.10
Gait speed	1.03	.000	0.04	0.90	.000	0.05	0.69	.000	0.06
Turkish (reference: Dutch)				2.00	.000	0.23	1.10	.000	0.25
Moroccan (reference: Dutch)				-0.21	.394	0.25	0.36	.169	0.26
Gait speed * Turkish							0.84	.000	0.11
Gait speed * Moroccan							-0.05	.621	0.11
R ²	0.34	.000		0.38	.030		0.41	.000	

Table 3.1c. Linear regression of activity limitations without the item on public transportation

	Model 1			Model 2			Model 3		
	<i>B</i>	<i>p</i>	<i>SE</i>	<i>B</i>	<i>p</i>	<i>SE</i>	<i>B</i>	<i>p</i>	<i>SE</i>
Constant	1.94	.000	0.08	1.69	.000	0.10	1.55	.000	0.10
Gait speed	1.02	.000	0.039	0.92	.000	0.05	0.74	.000	0.06
Turkish (reference: Dutch)				1.71	.000	0.23	0.91	.000	0.25
Moroccan (reference: Dutch)				-0.43	.085	0.25	0.10	.71	0.27
Gait speed * Turkish							0.74	.000	0.11
Gait speed * Moroccan							-0.07	.55	0.12
R ²	0.34	.000		0.38	.030		0.41	.000	

Table 3.1d. Linear regression of activity limitations without the item on bathing

	Model 1			Model 2			Model 3		
	<i>B</i>	<i>p</i>	<i>SE</i>	<i>B</i>	<i>p</i>	<i>SE</i>	<i>B</i>	<i>p</i>	<i>SE</i>
Constant	2.07	.000	0.08	1.79	.000	0.10	1.66	.000	0.11
Gait speed	1.10	.000	0.04	0.97	.000	0.05	0.81	.000	0.06
Turkish (reference: Dutch)				1.87	.000	0.24	1.02	.000	0.26
Moroccan (reference: Dutch)				-0.45	.081	0.26	0.16	.558	0.28
Gait speed * Turkish							0.75	.000	0.11
Gait speed * Moroccan							-0.15	.207	0.12
R ²	0.34	.000		0.38	.030		0.41	.000	

